

ETSI TS 138 415 V15.0.0 (2018-07)



**5G;
NG-RAN;
PDU Session User Plane protocol
(3GPP TS 38.415 version 15.0.0 Release 15)**



Reference

RTS/TSGR-0338415vf00

Keywords

5G

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

The present document can be downloaded from:

<http://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the only prevailing document is the print of the Portable Document Format (PDF) version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status.

Information on the current status of this and other ETSI documents is available at

<https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

If you find errors in the present document, please send your comment to one of the following services:

<https://portal.etsi.org/People/CommiteeSupportStaff.aspx>

Copyright Notification

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2018.

All rights reserved.

DECT™, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members.

3GPP™ and **LTE™** are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

oneM2M logo is protected for the benefit of its Members.

GSM® and the GSM logo are trademarks registered and owned by the GSM Association.

Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<https://ipr.etsi.org/>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

Foreword

This Technical Specification (TS) has been produced by ETSI 3rd Generation Partnership Project (3GPP).

The present document may refer to technical specifications or reports using their 3GPP identities, UMTS identities or GSM identities. These should be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between GSM, UMTS, 3GPP and ETSI identities can be found under <http://webapp.etsi.org/key/queryform.asp>.

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

Contents

Intellectual Property Rights	2
Foreword.....	2
Modal verbs terminology.....	2
Foreword.....	4
1 Scope	5
2 References	5
3 Definitions and abbreviations.....	5
3.1 Definitions	5
3.2 Abbreviations	5
4 General	5
4.1 General aspects.....	5
5 PDU Session user plane protocol	6
5.1 General	6
5.2 PDU Session user plane protocol layer services.....	6
5.3 Services expected from the Transport Network Layer	6
5.4 Elementary procedures	6
5.4.1 Transfer of DL PDU Session Information	6
5.4.1.1 Successful operation.....	6
5.4.1.2 Unsuccessful operation	6
5.4.2 Transfer of UL PDU Session Information	7
5.4.2.1 Successful operation.....	7
5.4.2.2 Unsuccessful operation	7
5.5 Elements for the PDU Session user plane protocol.....	7
5.5.1 General.....	7
5.5.2 Frame format for the PDU Session user plane protocol.....	8
5.5.2.1 DL PDU SESSION INFORMATION (PDU Type 0).....	8
5.5.2.2 UL PDU SESSION INFORMATION (PDU Type 1).....	8
5.5.3 Coding of information elements in frames	9
5.5.3.1 PDU Type	9
5.5.3.2 Spare	9
5.5.3.3 QoS Flow Identifier (QFI)	9
5.5.3.4 Reflective QoS Indicator (RQI)	9
5.5.3.5 Padding	9
5.5.4 Timers.....	10
5.6 Handling of unknown, unforeseen and erroneous protocol data	10
Annex A (informative): Example of using Future Extension Field.....	11
A.1 Example of using Future Extension field	11
A.1.1 New IE Flags.....	11
Annex B (informative): Change history	12
History	13

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
 - 1 presented to TSG for information;
 - 2 presented to TSG for approval;
 - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present document specifies the PDU Session user plane protocol being used over the NG-U, Xn-U and N9 interfaces. Applicability to other interfaces is not precluded.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] 3GPP TS 38.300: "NextGen Radio Access Network (NG-RAN); Overall description; Stage 2".
- [3] 3GPP TS 29.281: "General Packet Radio System (GPRS) Tunnelling Protocol User Plane (GTPv1-U)".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

NG-U: logical interface between NG-RAN node and UPF as described in TS 38.300 [2].

Xn-U: logical interface between NG-RAN nodes as defined in TS 38.300 [2].

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

QFI	QoS Flow Identifier
RQA	Reflective QoS Attribute
RQI	Reflective QoS Indication
UP	User Plane
UPF	User Plane Function

4 General

4.1 General aspects

The PDU Session User Plane protocol is located in the User Plane of the Radio Network Layer above the Transport Network Layer of the interface.

Each PDU session User Plane protocol instance is associated to one PDU Session.

In this version of the present document, the PDU session user plane protocol data is conveyed by GTP-U protocol means, more specifically, by means of the "GTP-U Container" GTP-U Extension Header as defined in TS 29.281 [3].

5 PDU Session user plane protocol

5.1 General

The PDU session UP layer uses services of the Transport Network Layer in order to send its packets over the interface.

5.2 PDU Session user plane protocol layer services

The following functions are provided by the PDU Session User Plane protocol:

- Provision of control information elements (e.g. QFI, RQI) associated with a PDU session.

5.3 Services expected from the Transport Network Layer

The PDU session UP layer expects the following services from the Transport Network Layer:

- Transfer of PDU session User Plane PDUs.

5.4 Elementary procedures

5.4.1 Transfer of DL PDU Session Information

5.4.1.1 Successful operation

The purpose of the Transfer of DL PDU Session Information procedure is to send control information elements related to the PDU Session from UPF/NG-RAN to NG-RAN.

A PDU Session user plane instance making use of the Transfer of DL PDU Session Information procedure is associated to a single PDU Session. The Transfer of DL PDU Session Information procedure may be invoked whenever packets for that particular PDU Session need to be transferred across the related interface instance.

The DL PDU Session Information frame includes a QoS Flow Identifier (QFI) field associated with the transferred packet. The NG-RAN shall use the received QFI to determine the QoS flow and QoS profile which are associated with the received packet.

The DL PDU Session Information frame shall also include the Reflective QoS Indicator (RQI) field to indicate that user plane Reflective QoS shall be activated or not. The NG-RAN shall, if RQA has been configured for the involved QoS flow, take the RQI into account and propagate the activation towards the UE or a peer NG-RAN node for this particular packet.

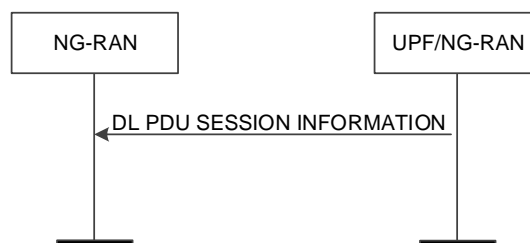


Figure 5.4.1.1-1: Successful Transfer of DL PDU Session Information

5.4.1.2 Unsuccessful operation

Void.

5.4.2 Transfer of UL PDU Session Information

5.4.2.1 Successful operation

The purpose of the Transfer of UL PDU Session Information procedure is to send control information elements related to the PDU Session from NG-RAN to UPF.

An UL PDU Session user plane instance making use of the Transfer of UL PDU Session Information procedure is associated to a single PDU Session. The Transfer of UL PDU Session Information procedure may be invoked whenever packets for that particular PDU Session need to be transferred across the related interface instance.

The UL PDU Session Information frame includes a QoS Flow Identifier (QFI) field associated with the transferred packet. The UPF shall use the received QFI to determine the QoS flow and QoS profile which are associated with the received packet.

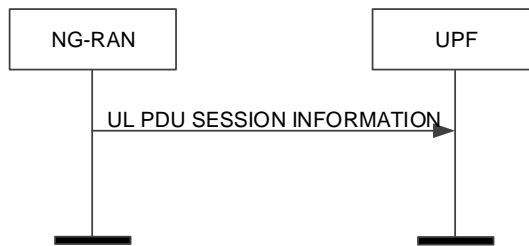


Figure 5.4.2.1-1: Successful Transfer of UL PDU Session Information

5.4.2.2 Unsuccessful operation

Void.

5.5 Elements for the PDU Session user plane protocol

5.5.1 General

In the present document the structure of frames are specified by using figures similar to figure 5.5.1-1.

Bits								Number of Octets	
7	6	5	4	3	2	1	0		
Field 1				Field 2				1	Octet 1
Field 3						Field 4		2	Octet 2
Field 4 continue				Spare					Octet 3
Field 6								2	Octet 4
Field 6 continue				Padding bits					Octet 5
Future Extension								0-m	
Padding								0-3	

Figure 5.5.1-1: Example frame format

Unless otherwise indicated, fields which consist of multiple bits within an octet have the most significant bit located at the higher bit position (indicated above frame in figure 5.5.1-1). In addition, if a field spans several octets, most significant bits are located in lower numbered octets (right of frame in figure 5.5.1-1).

On the NG interface, the frame is transmitted starting from the lowest numbered octet. Within each octet, the bits are sent according to decreasing bit position (bit position 7 first).

Spare bits should be set to "0" by the sender and should not be checked by the receiver.

The header part of the frame is always an integer number of octets. The payload part is octet aligned (by adding 'Padding Bits' when needed).

The receiver should be able to remove an additional Future Extension field that may be present. See description of Future Extension field in A.1.

Padding octets may be added at the end of the frame, see Padding in 5.5.3.5.

5.5.2 Frame format for the PDU Session user plane protocol

5.5.2.1 DL PDU SESSION INFORMATION (PDU Type 0)

This frame format is defined to allow the NG-RAN to receive some control information elements which are associated with the transfer of a packet over the interface.

The following shows the respective DL PDU SESSION INFORMATION frame.

Bits								Number of Octets
7	6	5	4	3	2	1	0	
PDU Type (=0)				Spare				1
Spare	RQI	QoS Flow Identifier						1
Padding								0-3

Figure 5.5.2.1-1: DL PDU SESSION INFORMATION (PDU Type 0) Format

5.5.2.2 UL PDU SESSION INFORMATION (PDU Type 1)

This frame format is defined to allow the UPF to receive some control information elements which are associated with the transfer of a packet over the interface.

The following shows the respective UL PDU SESSION INFORMATION frame.

Bits								Number of Octets
7	6	5	4	3	2	1	0	
PDU Type (=1)				Spare				1
Spare		QoS Flow Identifier						1
Padding								0-3

Figure 5.5.2.2-1: UL PDU SESSION INFORMATION (PDU Type 1) Format

5.5.3 Coding of information elements in frames

5.5.3.1 PDU Type

Description: The PDU Type indicates the structure of the PDU session UP frame. The field takes the value of the PDU Type it identifies; i.e. "0" for PDU Type 0. The PDU type is in bit 4 to bit 7 in the first octet of the frame.

Value range: {0=PDU SESSION INFORMATION 1-15=reserved for future PDU type extensions}.

Field length: 4 bits.

5.5.3.2 Spare

Description: The spare field is set to "0" by the sender and should not be interpreted by the receiver. This field is reserved for later versions.

Value range: $(0-2^n-1)$.

Field Length: n bits.

5.5.3.3 QoS Flow Identifier (QFI)

Description: When present this parameter indicates the QoS Flow Identifier of the QoS flow to which the transferred packet belongs.

Value range: $\{0..2^6-1\}$.

Field length: 6 bits.

5.5.3.4 Reflective QoS Indicator (RQI)

Description: This parameter indicates activation of the reflective QoS towards the UE for the transferred packet as described in clause 5.4.1.1. It is used only in the downlink direction. If RQA (Reflective QoS Activation) has not been configured for the involved QoS flow, the RQI shall be ignored by the NG-RAN node.

Value range: {0= Reflective QoS activation not triggered, 1= Reflective QoS activation triggered}.

Field length: 1 bit.

5.5.3.5 Padding

Description: The padding is included at the end of the frame to ensure that the PDU Session user plane protocol PDU length (including padding and the future extension) is $(n*4-2)$ octets, where n is a positive integer. If there is any future extension, the padding should be added after the future extensions.

Field Length: 0-3 octets.

5.5.4 Timers

Void.

5.6 Handling of unknown, unforeseen and erroneous protocol data

Void.

Annex A (informative): Example of using Future Extension Field

A.1 Example of using Future Extension field

New IE flag 7(E)	New IE flag 6	New IE flag 5	New IE flag 4	New IE flag 3	New IE flag 2	New IE flag 1	New IE flag 0	1 Octet New IE Flags
New IE 1								3 Octets
New IE 2								2 Octets

Figure A.1-1: Example of future Extension Field

In the Example of the future Extension Field, New IE flag 0 indicates if the New IE 1 is present or not. New IE flag 1 indicates if the new IE 2 is present or not.

A.1.1 New IE Flags

Description: The *New IE Flags* IE is only present if at least one new IE is present. The *New IE Flags* IE contains flags indicating which new IEs that are present following the *New IE Flags* IE. The last bit position of the *New IE Flags* IE is used as the Extension Flag to allow the extension of the *New IE Flags* IE in the future. Extension octets of the *New IE Flags* IE shall follow directly after the first octet of the *New IE Flags* IE. When an extension octet of the *New IE Flags* IE is present, then all previous extension octets of the *New IE Flags* IE and the *New IE Flags* IE shall also be present, even if they have all their flag bits indicating no presence of their respective new IEs.

Annex B (informative): Change history

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2018-04	R3#99bis	R3-181720				TS skeleton.	0.0.1
2018-04	R3#99bis	R3-182525				Integration of R3-182399 with sections 4 and 5 and annex A1.	0.1.0
2018-05	R3#100	R3-183594				Integration of R3-182619 to remove editor's notes, remove FFS and fix some editorials; integration of R3-183413 introducing PDU type for downlink and uplink; removing the FFS of uplink frame type in line with R3-182619 for downlink frame type; integration of R3-183000 solving the FFS on QFI.	0.2.0
2018-06	RAN#80	RP-180740				For approval.	1.0.0
2018-06	RAN#80		-	-	-	Specification approved at TSG-RAN and placed under change control	15.0.0

History

Document history		
V15.0.0	July 2018	Publication